DOCUMENT RESUME

ED 331 246 EC 300 228

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TITLE Total Communication for Children with Down Syndrome? Patterns across Six Children.
PUB DATE 18 Nov 90
NOTE 15p.; Poster presented at the Annual Conference of the American Speech-Language-Hearing Association (Seattle, WA, November 18, 1990).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Comprehension; *Downs Syndrome; Early Intervention; Expressive Language; Home Programs; Individual Differences; Infants; *Language Acquisition; Parent Child Relationship; *Parent Participation; Program Effectiveness; Receptive Language; Sign Language; Total Communication; Verbal Ability; Young Children

ABSTRACT

The project evaluated the effectiveness of using Total Communication (simultaneous use of sign language and speech) with six infants with Down syndrome as a means of fostering communication while verbal skills and articulatory proficiency develop. Each child was seen within the home environment every second week through 24 months of age and once a month from 25 through 30 months of age. Parents were taught signs for common toys and objects as well as common activities. Subjects were frequently evaluated for comprehension (17 to 24 months of age) and expressive language (through 30 months of age) and parents were asked to keep a language diary of their child's vocabulary development in both signs and words. Results were quite variable among the children, stressing the importance of individual differences. Findings suggest therapists should consider the following factors in deciding whether to use a Total Communication approach: (1) the degree to which the child is exhibiting a verbal expressive language delay relative to his/her receptive language at 12 months and 24 months; (2) the status of the child's middle ear function and hearing acuity; (3) the child's oral-motor status or extent of difficulty in the area of feeding; and (4) the parent's comfort level and ability to use Total Communication consistently. Test results for each child are presented graphically in the appendixes. Includes nine references. (DB)

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Poster Presented at the 1990
Annual Conference of the
American Speech-Language-Hearing Association

Seattle, Washington
November 18, 1990

ED331246

TOTAL COMMUNICATION FOR CHILDREN WITH DOWN SYNDROME?

Patterns Across Six Children

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INTRODUCTION

A review of the literature (Beeghly, Hanrahan, Weiss & Cicchetti, 1985; Cardosa-Martins, Mervis & Mervis, 1985, Miller, 1987, 1989) indicates that children with Down syndrome exhibit a verbal expressive language delay which is more extensive than their general cognitive and receptive delays. Possible underlying causes of the expressive language delay include increased frequency of middle ear pathology, oral motor deficits, decreased expectations for communicative performance, auditory processing difficulties, or any combination of the above. (Miller, 1987). Given these risk factors, there is a need to develop interventions which foster communicative interaction and verbal language development in children with Down syndrome.

The use of Total Communication (simultaneous use of sign language and speech) with infants and young children with Down syndrome has become increasingly popular (Kouri, 1989, Gibbs & Carswell, in press). However, little research has examined the outcomes of using Total Communication with this population.

This project was designed to evaluate the effectiveness of using Total Communication with infants with Down syndrome as a means of fostering communication while verbal skills and articulatory proficiency develop. We were particularly interested in examining individual differences in the pattern of sign and speech acquisition across children and identifying factors that may indicate which children would benefit most from Total Communication (TC).

SUBJECTS

These six children are part of a larger sample of children being followed by the Early Communication Enhancement Project. Children were recruited to participate in the project through the Down Syndrome Clinic in Hanover, New Hampshire, and early intervention programs in New Hampshire and Vermont. All children presented here are boys from intact, middle class families. Five boys have chromosomal karyotypes of Trisomy 21. One has an unbalanced translocation involving chromosome 9.

INTERVENTION METHOD

Each child was seen within the home environment by a certified speech/language pathologist beginning when the child was 14 months of age. Each child was seen every other week through 24 months of age and once a month from 25 through 30 months of age. Intervention was play-based and encouraged the participation of the child's parents and other family members. The focus of these visits was to provide global communication intervention which integrated the use of TC.

SINGLE SUBJECT DESIGN

A single subject design was used to compare each child's receptive and expressive language development within verbal and sign modalities. At the beginning of the project, parents were asked to rate common toys and objects (i.e., music, truck, doll) for their reinforcement value. This allowed us to select two "toy sets" of 10 toys each which were matched for the reinforcement value of each item and the phonetic complexity of the verbal label.

Parents were taught the signs for only one set of toys and objects. All 20 toys were readily available and parents were encouraged to engage their child in play with all toys. Each family was encouraged to expand their use of TC to the level that they felt comfortable by using meaningful, functional signs (more, all done, eat, drink, bath, etc.) that could be incorporated within their daily routine and activities.

FORMAL EVALUATION

At 12 and 24 months of age, each child participated in a comprehensive evaluation consisting of medical, cognitive, receptive and expressive language, oral motor and audiological assessments. The medical exam provided a health history for each child including frequency of middle ear infections or effusions. During the physical exam, the status of the child's tympanic membranes was noted. An audiological exam involved sound field testing along with a tympanogram. Cognitive assessment involved the administration of the Bayley Scales

of Infant Development (Bayley, 1969). Language assessment was completed using the Sequenced Inventory of Communication Development-Revised (Hedrick, Prather & Tobin, 1984). Oral Motor functioning was observed during feeding and rated on a scale modified from Morris & Klein (1987). A composite measure of oral motor functioning was created by summing the ratings on the following items: lip closure and tongue control during spoon feeding, cup drinking, and amount of drooling. Low scores indicate poorer oral motor status.

COMPREHENSION TESTING

From 17 months through 24 months of age, each child's comprehension of "toy set" words (verbal and TC) was monitored on a monthly basis. Each month, the child's understanding of five words from each "toy set" was tested. The child was asked to find the named object from a field of three toys/objects over two trials (foils were selected from the same toy set as the targeted item). Targeted words, toy position and order in which the items were tested were randomly determined. The remaining five words from each "toy set" were tested the following month. Reliability, established on 28% of the sessions, was 93.6%. The graphs found in Appendix A present the percentage of correct responses by the child at each testing. On some occasions, testing was not possible due the child's disinterest in the activity, illness, etc. Therefore, boxes ⊣□⊢ are used to indicate actual testing points.

EXPRESSION TESTING

Formal expression testing began when the child demonstrated the emerging ability to communicate targeted words. Testing continued through 30 months of age and was monitored on a monthly basis. All words in both "toy sets" were elicited within play involving targeted toys/objects. The child was encouraged to label the targeted toys following the prompt: "What is this?" or "I see/have a....". If the child did not spontaneously label the item, a verbal or TC model was presented by the clinician. Credit was given if the child made an imitative response. Verbal approximations and modified signs were accepted. Each testing session was videotaped and every fourth tape reviewed for reliability purposes. Reliability, established on 25% of the testing sessions was obtained at 98.9% . The graphs found in Appendix B present the percentage of correct responses the child demonstrated either spontaneously or imitatively in response to the prompt.

LANGUAGE DIARY

Parents were asked to keep an ongoing language diary of all verbal words and signs their child used imitatively and spontaneously. The context in which these words and signs occurred was also noted. Natural gestures such as reaching "up", and waving "hi" were not included in our scoring. Words were entered into the diary when the word or sign was initially produced and understood by the parent. Language diaries were updated on a regular basis with the assistance of the speech/language pathologist. The graphs found in Appendix C present a cumulative count of the child's vocabulary as reported by the parent.

RESULTS - COMPREHENSION

The use of TC consistently enhanced comprehension in two children (Child E & F) but did not have a significant effect on comprehension abilities in the remaining children.

One might expect TC to enhance language comprehension in children who experienced middle ear dysfunction and decreased hearing acuity. However, the language comprehension of the two children with mild conductive hearing loss (Child C & D) was not significantly enhanced by the use of TC.

Many families reported that the use of TC increased the child's ability to attend to the speaker. In this testing situation, great efforts were always taken to obtain the child's attention prior to requesting an item. Therefore, the effect of using TC to enhance visual attention could not be determined.

RESULTS - EXPRESSION TESTING

Direct testing of expressive ability provided insight into which mode of communication was used more consistently and extensively to communicate in a free play setting. In addition, it compared the ability of the child to use words for items that have been matched for phonetic complexity and reinforcement value. Since most of the children demonstrated limited spontaneous communication during this task, the results include both imitative and spontaneous responses. Examining only spontaneous responses revealed similar but less pronounced patterns.

Results of the direct expressive testing revealed that Child A preferred to use a verbal modality. Child B and Child C used both modalities equally. From 26 months onward, Child C's use of sign exceeded his verbal expression. Child D, Child E, and Child F used sign more frequently than verbal speech to label toys.

RESULTS - LANGUAGE DIARY

Parent diaries revealed a steady increase with age in both expressive verbal and sign vocabulary for all children.

The first four children (A,B,C & D) were reported to have larger verbal than sign vocabularies, although their vocabularies increased in both modalities. Child C revealed greater use of sign between 19 and 22 months at which point his verbal vocabulary began to exceed his sign vocabulary. Child E and F's sign vocabulary were reported to consistently exceed their verbal vocabulary. In fact, these two children showed extremely limited verbal speech production through 30 months.

PATTERNS - COGNITION

BAYLEY MENTAL DEVELOPMENT INDEX AT 24 MONTHS

	Child A	Child B	Child C	Child D	Child E	Child F
MDI	46	50	41	57	37	62
AE*	15	15	14	16	13.5	17

*AE = Age Equivalent in months

A child's level of cognitive development was not found to be related to his use of signs. In fact, Child E and F, who showed the greatest reliance on TC, had the lowest and highest mental development indexes (MDIs), respectively. The heavy fine-motor demands of the Bayley Scales of Infant Development may make the MDI a poor indicator of cognition, particularly in children with Down syndrome who frequently exhibit hypotonicity.

PATTERNS - EXPRESSIVE LANGUAGE DELAY

Sequenced Inventory of Communication Development-Revised Receptive (RCA) and Expressive (ECA) Age Levels

	Child A	Child B	Child C	Child D	Child E	Child F
RCA @ 12 mos	8	8	12	8	12	12
ECA @ 12 mos	8	8	4	12	4	8
RCA @ 24 mos	16	20	16	16	16	20
ECA @ 24 mos	12	16	12	16	4	12

Of the three children (Child C, E, & F) who demonstrated expressive language delays relative to their receptive language at 12 months, two (E & F) present a strong reliance on TC. Child C showed a preference for sign use in the early months according to the language diary as well as in the later months during expression testing. The two children who showed the greatest reliance on TC also showed the greatest expressive language delay at 24 months. Children who exhibited equal receptive and expressive skills at 12 months displayed the least overall use of TC.

PATTERNS - PARENTAL USE OF TOTAL COMMUNICATION

	Child A	Child B	Child C	Child D	Child E	Child F
Consistent Use?	No	Yes	Yes	Yes	Yes	Yes
# of signs used by parents at 24 months	12	22	30	27	38	11
# of signs used by child at 30 months - diary	15	23	20	20	28	21

The extent to which the child's family used TC was estimated by the number of signs they had introduced by the time their child was 24 months. Although this pattern is not as clear or definitive as the others, there appears to be some relationship between the number of signs a parent introduced and the child's sign vocabulary at 30 months of age.

The parents of Child A (Child A demonstrated the smallest sign vocabulary at 30 months) used TC only occasionally and did not introduce many signs beyond those required for the study. On the other hand, the parents of Child E, who demonstrated the greatest sign vocabulary at 30 months, used TC frequently and introduced the greatest number of signs to their child. Child F is an exception to this pattern given his continued acquisition of sign despite his parents more limited but consistent use of TC.

ORAL MOTOR STATUS
at 24 months

	Child A	Child B	Child C	Child D	Child E	Child F
Eats chopped table foods	Yes	Yes	Yes	Yes	No	Yes
Observed Oral Motor Function - Composite Score	15	14	10	--	9	16

One might expect that the children with the poorest oral motor status would benefit most from the use of TC. Our data indicate that one of the two children who showed the greatest reliance on TC did indeed demonstrate the poorest oral motor function and was the only child who had not begun to eat coarsely chopped table foods by 24 months. On the other hand, Child F who also relied heavily on TC had the best oral motor functioning of these six children.

HEARING

	Child A	Child B	Child C	Child D	Child E	Child F
12 MONTHS						
Field Sound Testing	W/NL*	W/NL	Mildly Abnorm	Mildly Abnorm	W/NL	W/NL
Tympanic Membranes	W/NL	W/NL	Fluid R&L	Fluid R&L	W/NL	W/NL
Tympanometry	W/NL	W/NL	Flat R&L	Flat R&L	W/NL	W/NL
Ventilation Tubes	No	No	15 mos	23 mos	No	No
24 MONTHS						
Field Sound Testing	W/NL	W/NL	W/NL	W/NL	W/NL	W/NL
Tympanic Membranes	Fluid R	W/NL	W/NL	W/NL	W/NL	Not Obtain
Tympanometry	Flat R	Not Obtain	W/NL	W/NL	Neg. Pres.	W/NL

* W/NL = Within normal limits

The two children who experienced middle ear dysfunction and decreased hearing acuity at twelve months made use of both verbal and sign modes of communicative expression. Child C, who had ventilation tubes placed bilaterally at 15 months of age, showed a preference for sign in the early months as reported in the language diary. Child D, who had ventilation tubes placed bilaterally at 23 months of age, showed a strong preference for using sign in the direct expressive testing situation. Thus, the use of TC appeared to have been beneficial in providing an additional avenue for communication, particularly prior to tube placement when hearing acuity was questionable.

CONCLUSIONS

The variable patterns of language acquisition in verbal and sign modalities across these six children who were introduced to TC at an early age highlights the importance of acknowledging individual differences among children.

Given the small number of children involved in this study and the focus on boys, the patterns must be interpreted with caution. However, the findings suggest that a number of factors are important when deciding whether to use a TC approach with a particular child and family. These factors include:

a. ***The degree to which the child is exhibiting a verbal expressive language delay relative to their receptive language at 12 months and 24 months:*** Children with notable and persistent expressive language delays may have a greater need for a transitional, augmentative mode of communication.

b. ***The status of the child's middle ear function and hearing acuity:*** Children with middle ear dysfunction and mild conductive hearing loss may benefit from the use of TC, particularly prior to placement of ventilation tubes.

c. ***The child's oral-motor status or extent of difficulty in the area of feeding:*** Children exhibiting poorer oral motor control as well as some with more adequate oral motor control can benefit from the use of TC. However, the presence of both poorer oral motor skills and delayed expressive language may indicate a particular need for a transitional, augmentative communication system.

d. ***The parent's comfort level and ability to use TC consistently:*** As one would expect, the extent to which parents use TC and their consistency in its use appears to influence the child's use of sign. Families who find signing unnatural and cumbersome are less likely to foster their child's use of sign. Introducing sign gradually and involving the parents in the selection of signs to be used may help parents become more comfortable in using TC.

Family members may also be reinforced by the child's use of sign. Families whose children pick up sign quickly may feel more motivated to continue. Those parents who find that their child is not using sign as readily may feel less motivated to continue their efforts. Parents can be reminded that children need repeated exposure to signs and words before they can use them expressively. Families who seek more immediate reinforcement may need to wait longer before introducing TC.

Every child is different. We cannot overlook the fact that TC may be more useful to some children and families than others. The current research provides some possible indicators for early use of TC. However, further research is needed to replicate and confirm the patterns observed in these children. In addition, we must also follow these children as they proceed into their preschool years to observe the long term effects of using TC.

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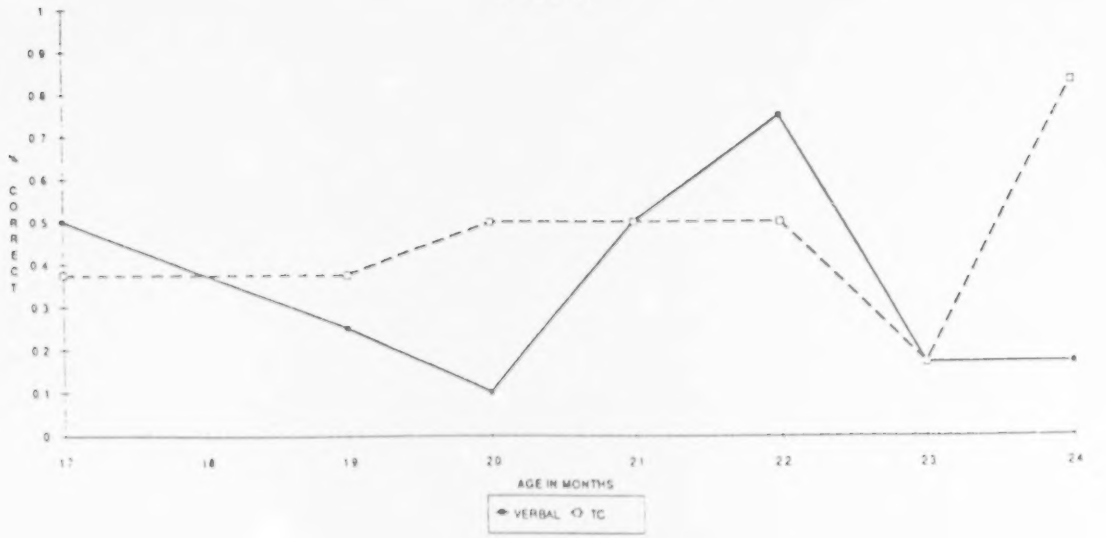
APPENDIX A

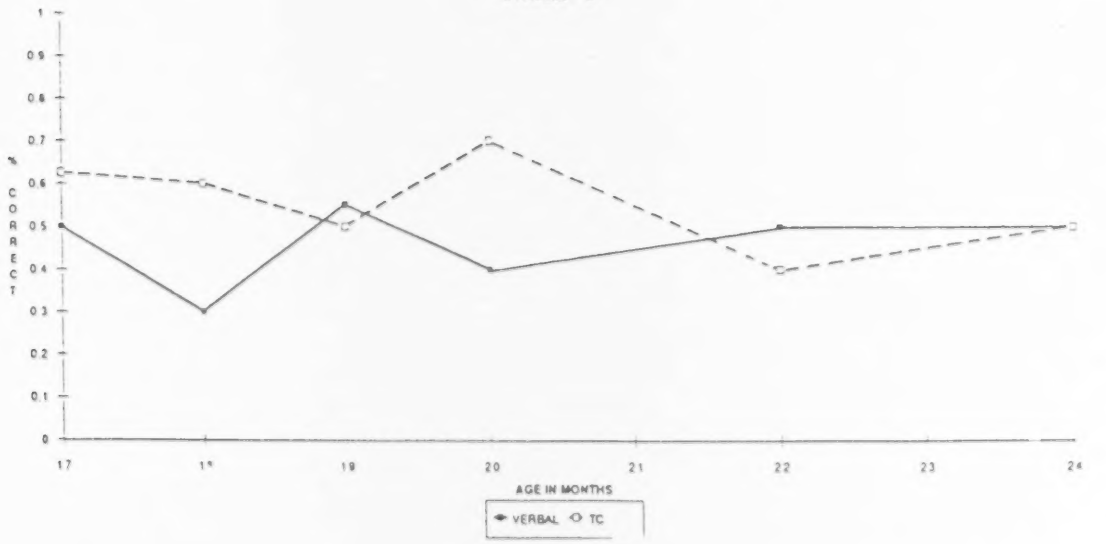
COMPREHENSION TESTING

CHILD A



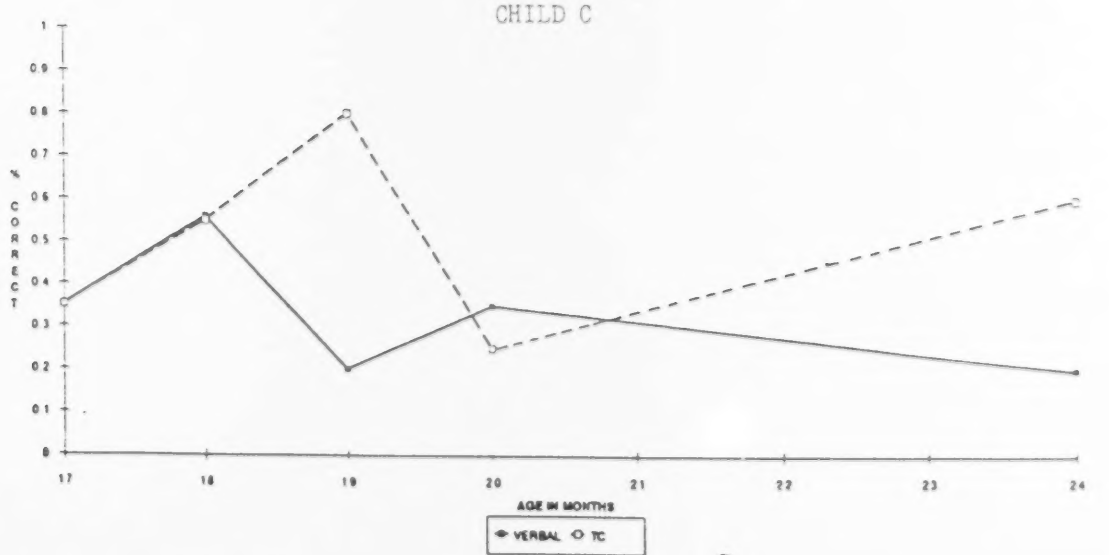
COMPREHENSION TESTING

CHILD B



COMPREHENSION TESTING

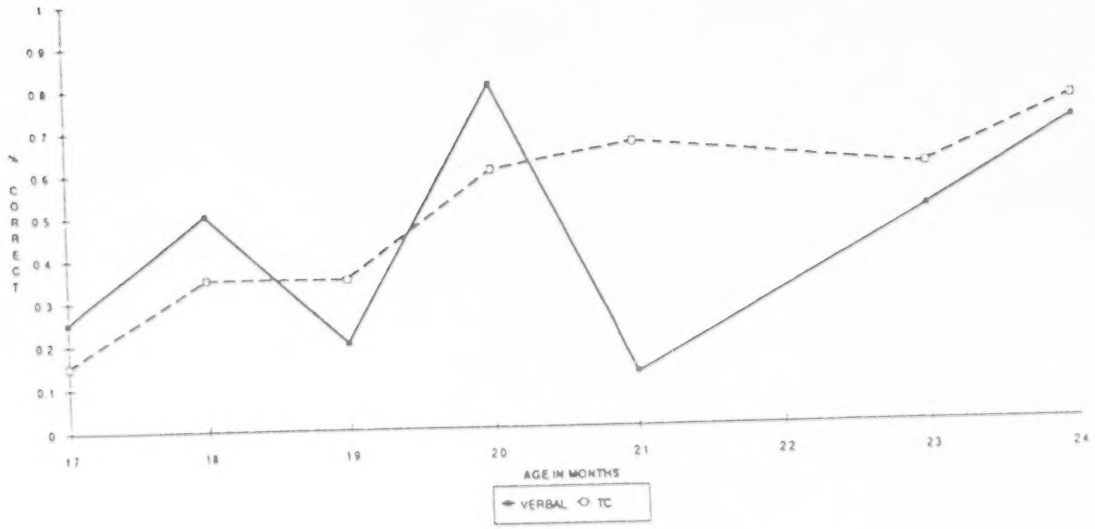
CHILD C



APPENDIX A

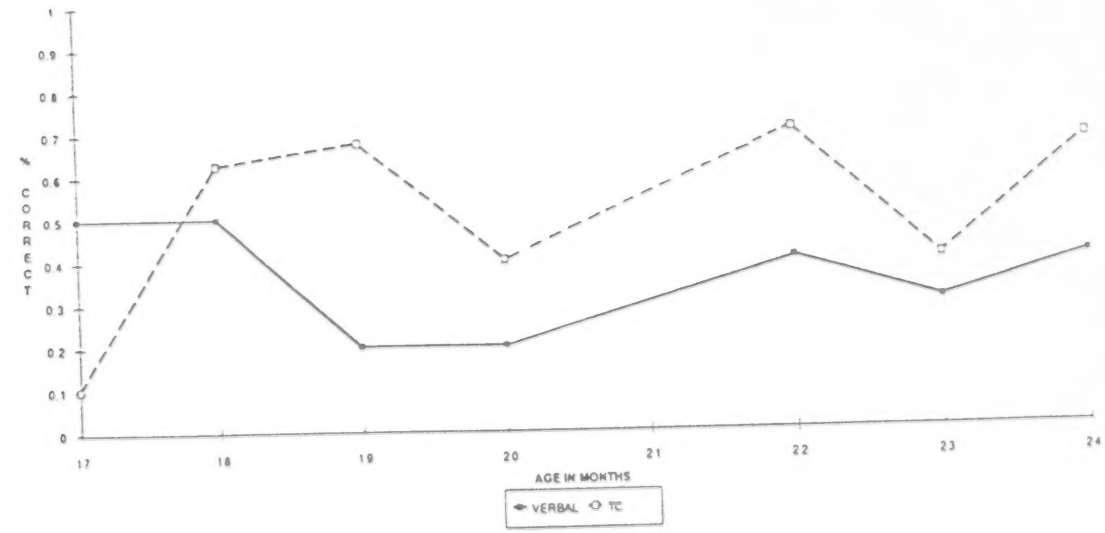
COMPREHENSION TESTING

CHILD D



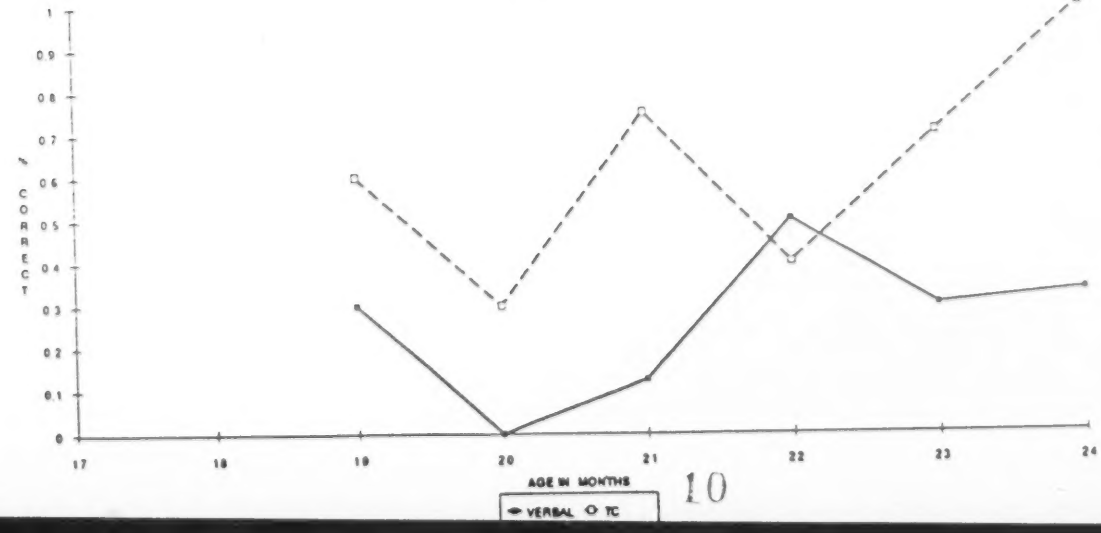
COMPREHENSION TESTING

CHILD E



COMPREHENSION TESTING

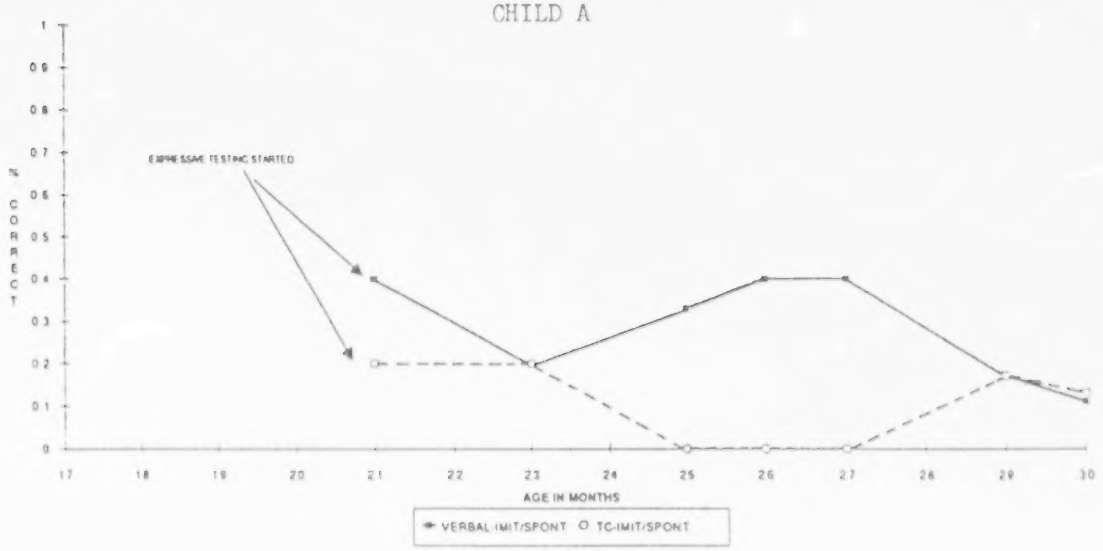
CHILD F



APPENDIX B

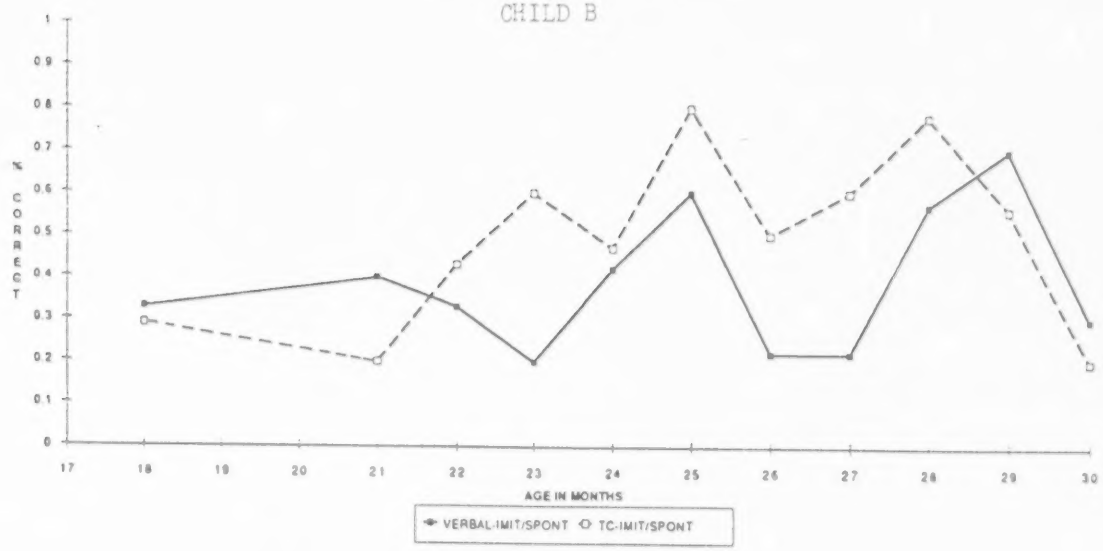
EXPRESSIVE TESTING (INCLUDING IMITATION)

CHILD A



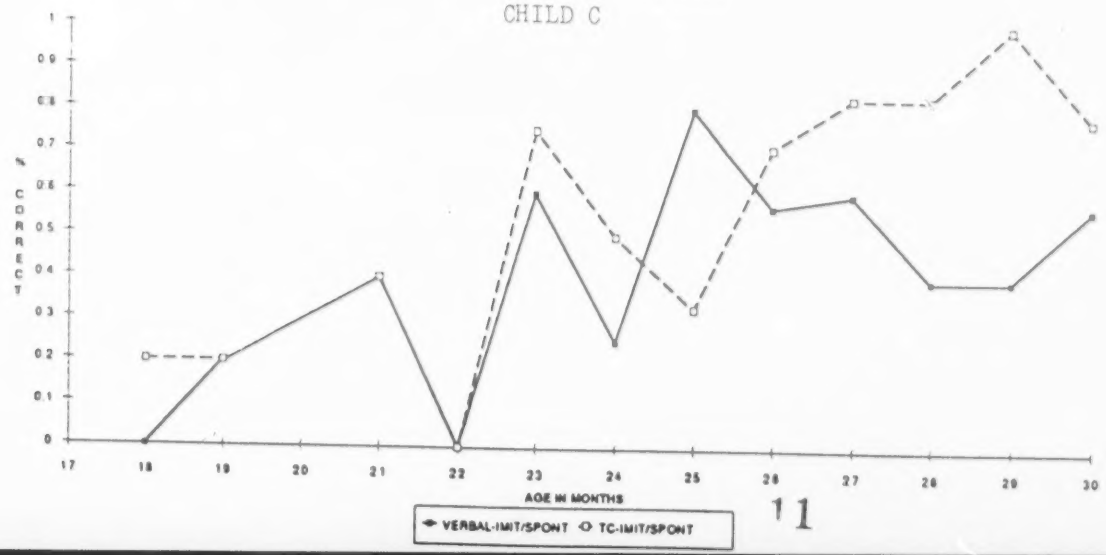
EXPRESSIVE TESTING (INCLUDING IMITATION)

CHILD B



EXPRESSIVE TESTING (INCLUDING IMITATION)

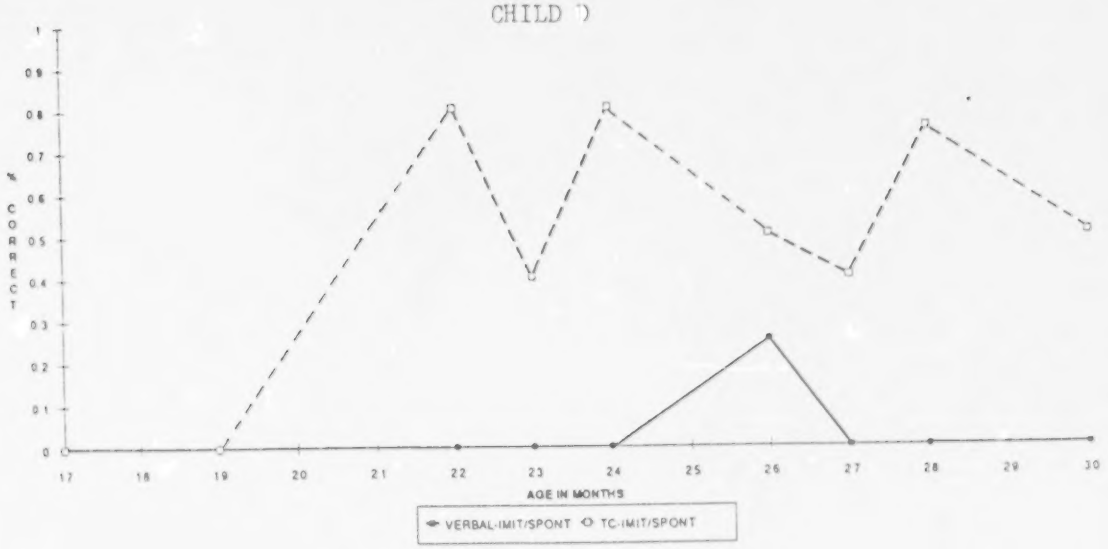
CHILD C



APPENDIX B

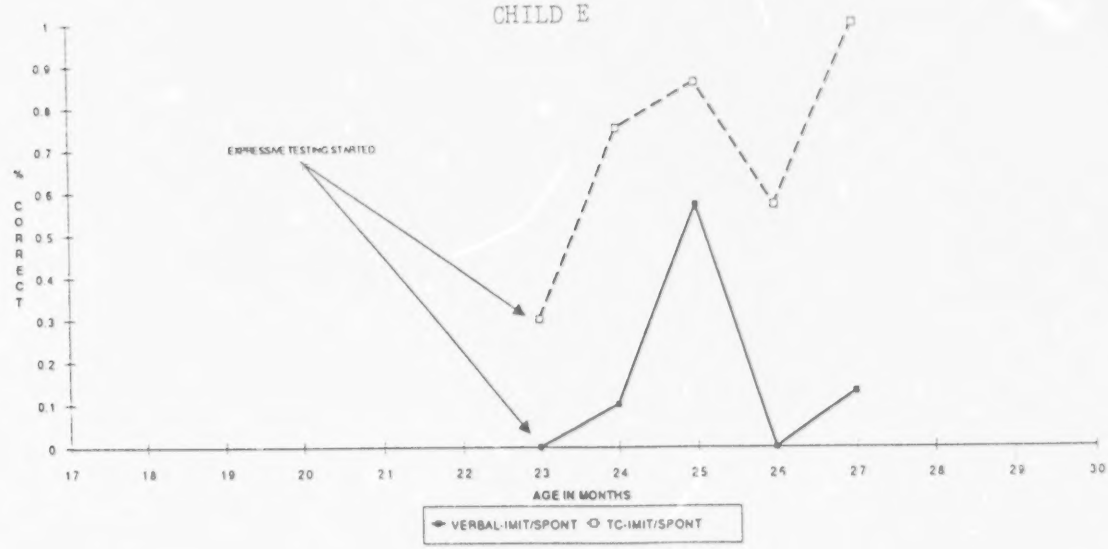
EXPRESSIVE TESTING (INCLUDING IMITATION)

CHILD D



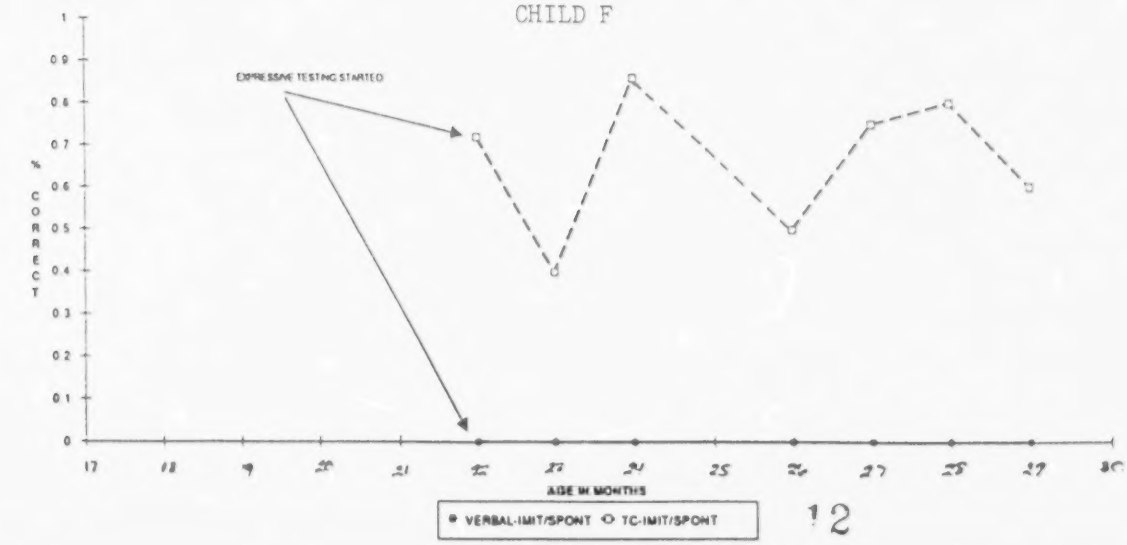
EXPRESSIVE TESTING (INCLUDING IMITATION)

CHILD E



EXPRESSIVE TESTING (INCLUDING IMITATION)

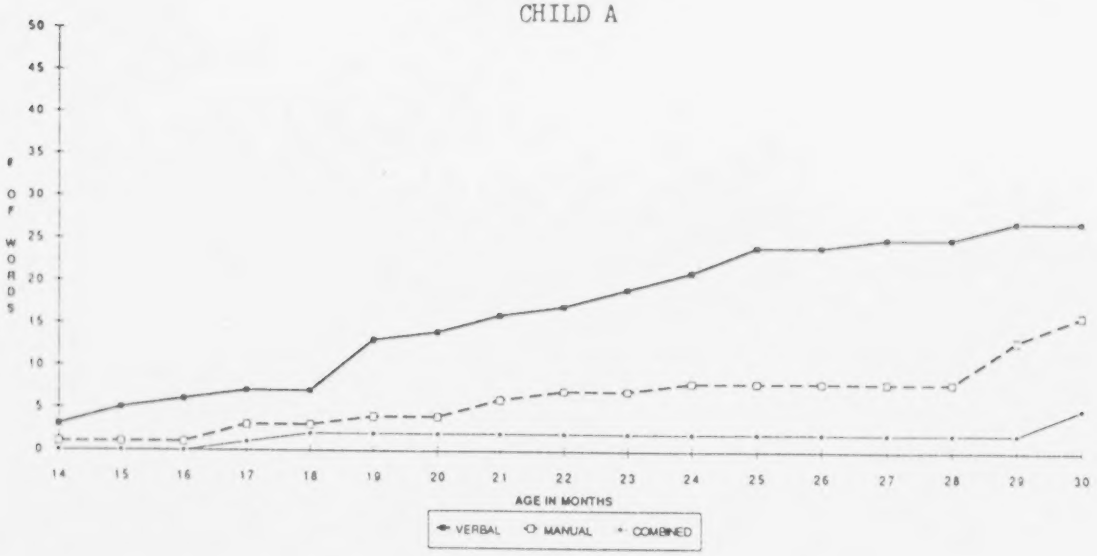
CHILD F



APPENDIX C

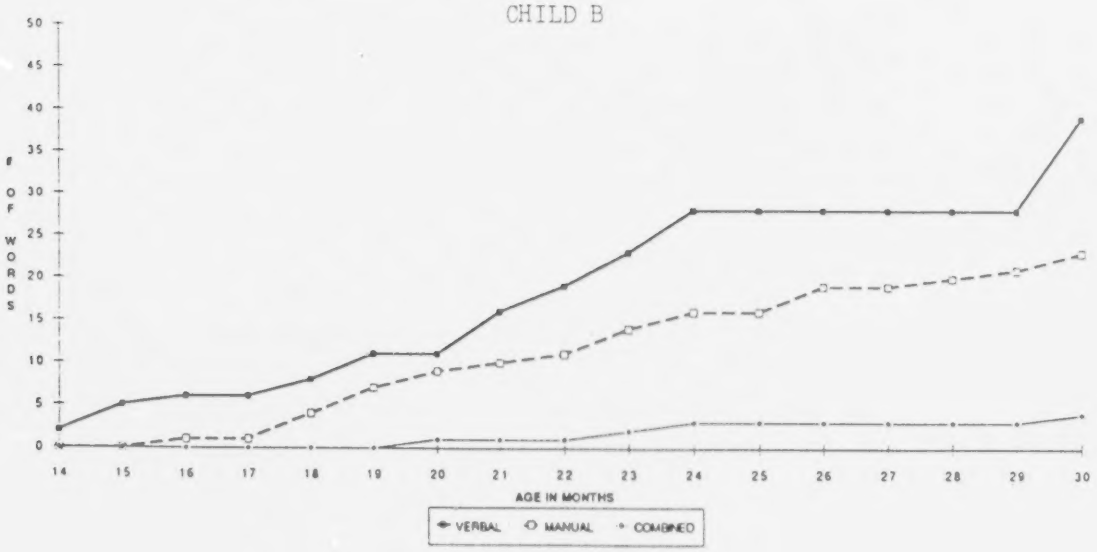
LANGUAGE DIARY

CHILD A



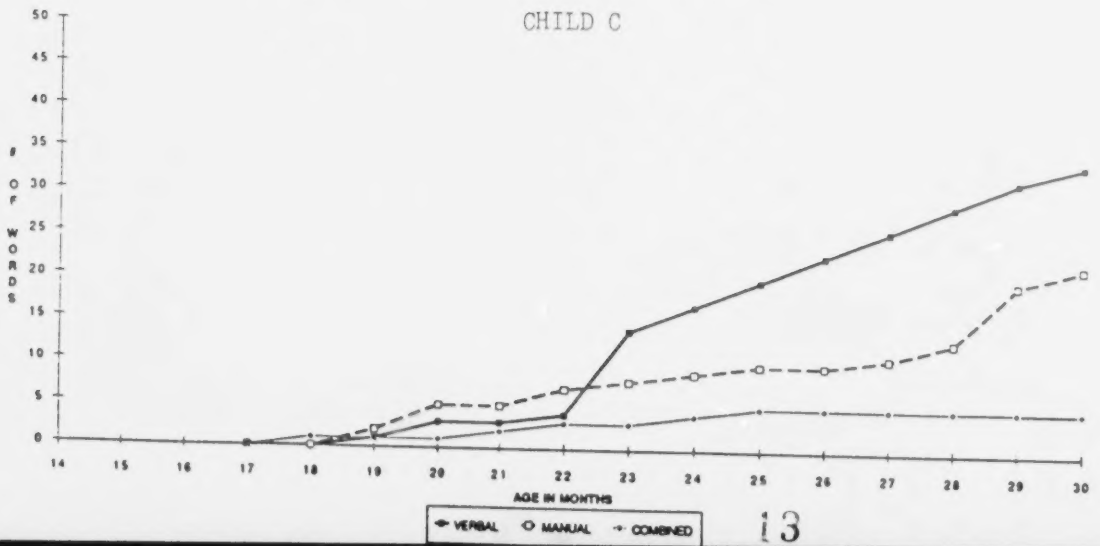
LANGUAGE DIARY

CHILD B



LANGUAGE DIARY

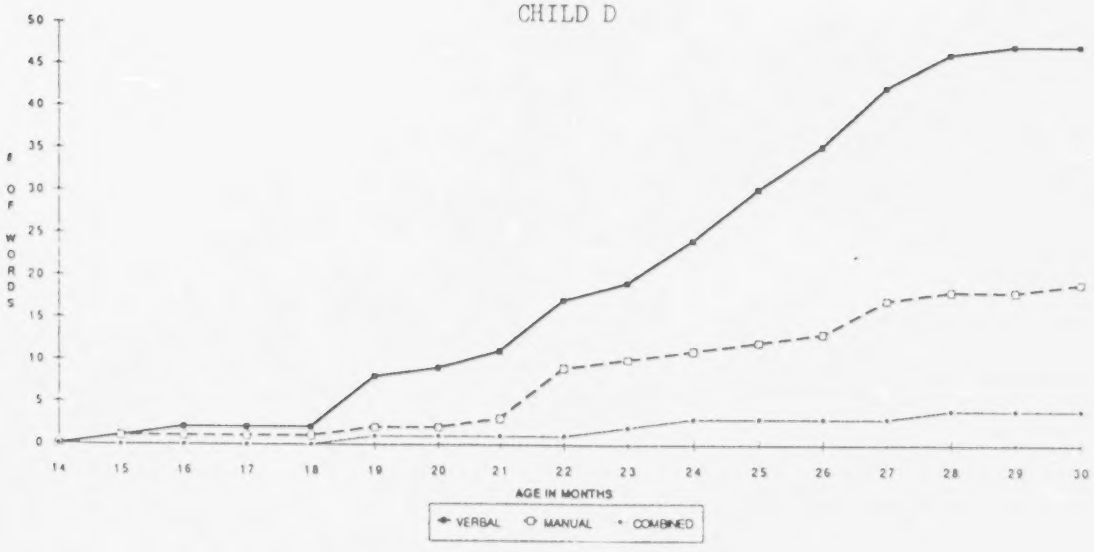
CHILD C



APPENDIX C

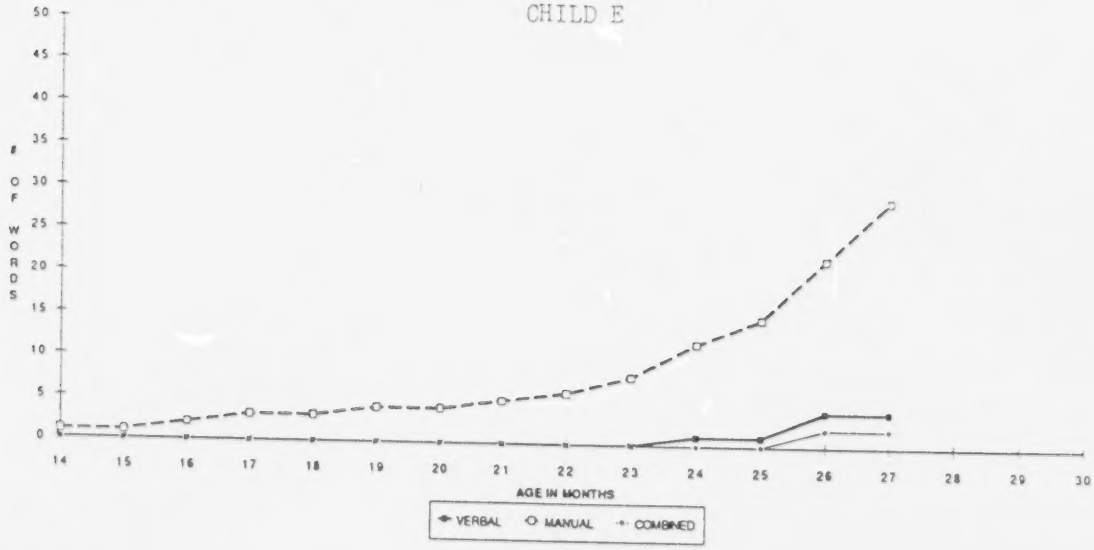
LANGUAGE DIARY

CHILD D



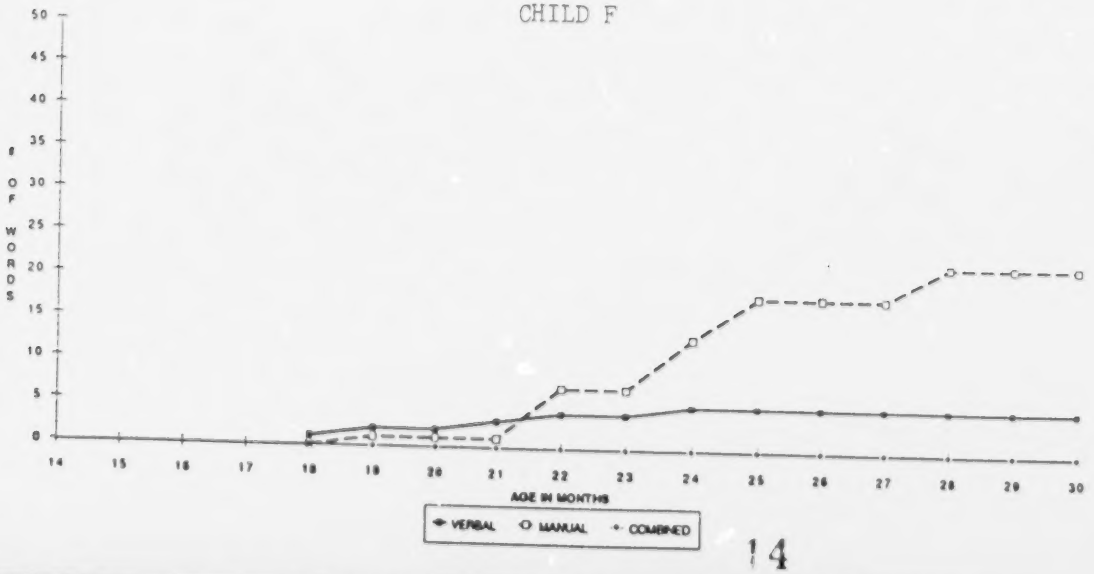
LANGUAGE DIARY

CHILD E



LANGUAGE DIARY

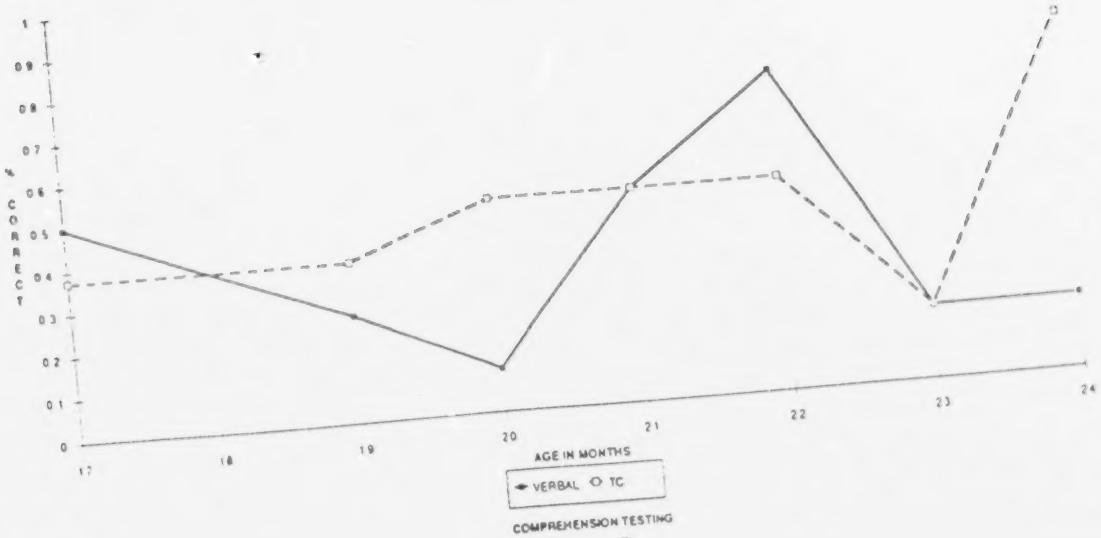
CHILD F



APPENDIX A

COMPREHENSION TESTING

CHILD A



COMPREHENSION TESTING

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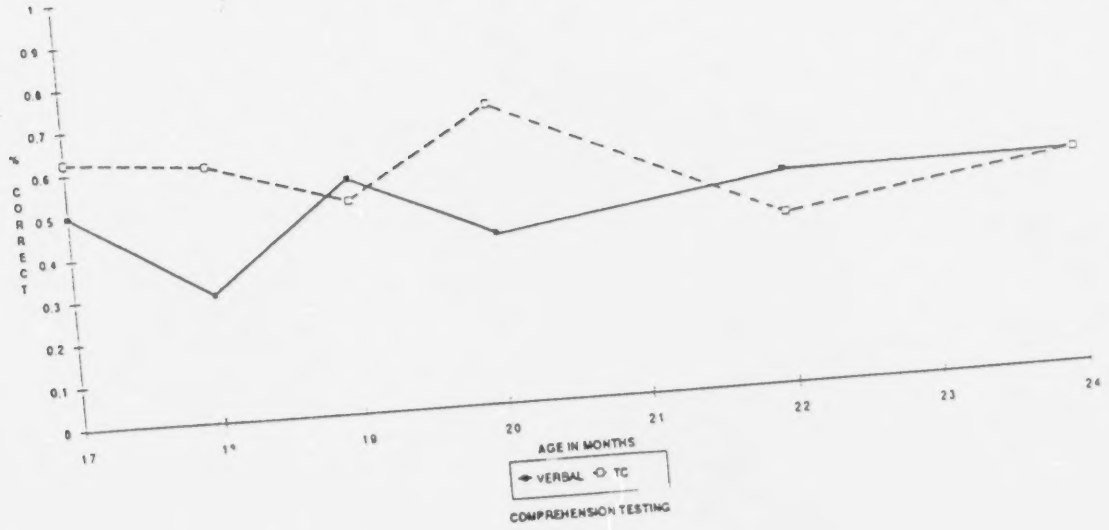

COMPREHENSION TESTING

CHILD C